

Occupational noise criteria and ‘Action Levels’

Marion Burgess (1) and Warwick Williams (2)

(1) University of New South Wales at the Australian Defence Force Academy, Canberra, ACT, 2600, Australia

(2) National Acoustic Laboratories, 126 Greville Street, Chatswood, NSW, 2067, Australia

ABSTRACT

Currently in both New Zealand and Australia the criteria for exposure to noise are based on two single values, namely the $L_{Aeq,8hr}$ of 85 dB for continuous noise and L_{Cpeak} of 140 dB for impulse noise. Recently the European Directive on Occupational Noise introduced the requirement of two ‘action levels’ below the criteria or exposure limits. The concept of legislated action levels and the requirements for workplaces once action levels are exceeded will be discussed. The benefits to Australia and New Zealand of such a stepped approach to occupational noise management will also be presented.

BACKGROUND

An action level is a concept that is used in occupational health and safety to indicate that a situation is becoming hazardous and so requires some ‘action’ to limit the exposure. An action level is frequently set at what is considered to be half the value of the permissible exposure limit but may vary as required or thought necessary (MSDS Hyper Glossary: 2006). The concept of ‘action levels’ in occupational health and safety (OHS) legislation and regulations, particularly with respect to noise exposure, has never really been applied or seriously considered in either New Zealand or Australia.

The European Union Directive (EC: 200) adopted in February 2003 defines two action levels below the exposure limit value, hence in this regulation there are three criteria for noise exposure. The terminology used in the Directive is a little different to what we are familiar with in Australia and New Zealand. Converting to terminology we are familiar with, the criteria are shown in Table 1.

Table 1 Exposure limits and action levels based on the EC Directive 2003/10/EC (2003)

Level	$L_{Aeq,8hr}$ (dB)	L_{Cpeak} (dB)
Exposure Limit	87	140
Upper Action	85	137
Lower Action	80	135

The action levels come into effect before the exposure limit values are reached. They are intended to act as precautionary measures lessening the exposure to those more susceptible individuals who would possibly suffer adverse affects at exposure levels less than the exposure limit value and to alert the workplace to a possible workplace hazard.

In this context there are two points to be noted. One is that an EC Directive requires the agreement of the majority of the member states and so inevitably represents a compromise. There is the opportunity for the member states to establish lower exposure levels in their own regulations on occupational noise..

The second is that exposure limit values are set not at a value that represents a “safe” exposure where no one would be expected to suffer harmful effect but rather they are set at

values that represent a level of ‘acceptable risk’ for the general community. For example the WHO (1980, p 44) states that “an 8h equivalent level of 75 dB(A) can be identified as the limit for protection against NIPTS” [noise-induced permanent threshold shift]. Exposure limit values are usually set well above the WHO ‘safe’ level as it is commonly deemed impractical to reduce noise levels to what would be considered to be a safe level.

In New Zealand and Australia, for example, the exposure limit value in the majority of jurisdictions is currently set at an $L_{Aeq,8h}$ of 85 dB for continuous noise (NOHSC:1007, 2000; HSER: 1995). At this level it is estimated (AS/NZS 1269.4:2005) that after a working life of 40 years 74% of an exposed otologically normal male population would on average suffer a six percent hearing loss – sufficient to lodge a hearing compensation claim in NSW, for example. Naturally some individuals would suffer from less loss and others from much more. This is regarded as an ‘acceptable’ price to pay by the community for being permitted to make noise at work.

The need to comply with limits for exposure to noise is well established in legislation in Australia and New Zealand. Most industries implement some form of noise management to try to comply with the exposure limits – even if there is unfortunately greater reliance on the use of personal hearing protectors than should be the case.

The inclusion in legislation of a defined action level for occupational noise, which is lower than the exposure limit, may cause concern among some managers. In particular, the actions they may be required to undertake - and of course the costs incurred by such actions. In this paper we hope to encourage the adoption of defined action levels into Australian and New Zealand and highlight that the actions need not be costly and in fact may well save costs in the longer term.

THE RATIONALE FOR ACTION LEVELS

The intention of including specified action levels in OHS noise regulations would be to reduce the incidence of noise injury in the community. This mechanism operates on two fronts: firstly by alerting both workers and management to a greater potential work hazard than that which currently exists; and secondly, by affording some degree of protection to those individuals who are ‘more sensitive’ to noise, and would tend to be affected at an exposure below that set in the regulations.

It should also be remembered, and experience will confirm, that when carrying out noise exposure measurements and calculations at different workplaces under a variety of conditions, a large margin for error exists. The accuracy and consistency of sound level meters may be high but the many variables affecting workplace noise exposure present at any one location may easily lead to an exposure estimation error of up to several dB.

The introduction of an action level below the recommended exposure standard can act as a warning or buffer that something needs to be done. Action levels also address the difficulty that currently exists in law where an exposure, $L_{Aeq,8h}$, of 84.4 dB rounded down to 84 dB is considered "safe" while that of 84.6 dB rounded up to 85 dB is considered hazardous. So an increase of only 0.2 dB means that the former case when no action is required suddenly becomes the latter case when a noise management program must be initiated.

PRECEDENTS FOR ACTION LEVELS

AS/NZS 1269.3: 2005 Occupational noise management, Part 3: Hearing protector program, section 6.2.1 states that:

As a practical measure many organizations make it a rule that people must wear hearing protectors whenever they are in areas or operating equipment where the immission level [ie L_{Aeq}] exceeds a specific value, such as 85 dB(A).

This is in effect an 'action level'. Organizations such as the Australian military have for many years set particular work areas, such as aircraft flight lines, where designated noise levels are exceeded for more than a predetermined time, appropriate hearing protectors must be worn (Defence Occupational Health and Safety Manual, SAFETYMAN). This is considered to be an easier and more reliable management method to avoid excessive noise exposure than determining the daily noise exposure for each person. In this system there are four noise zones; amber, red, black and extreme, each clearly signed and requiring increasing level of hearing protection. The definition of each zone is primarily defined by the noise level. For example an Amber Zone is declared if the noise level is between 85 and 100 dB(A) for a total of 15 minutes or more in a normal working day. A person entering an Amber zone is required to wear suitable hearing protectors, even if their $L_{Aeq,8hr}$ would not exceed the National Standard of 85 dB(A).

These forms of *de facto* action levels are set by organisations so that they can be seen to be acting responsibly and in the interests of the occupational health of their employees. It also means that in areas where there are potential noise hazards precautions can be adopted without the need to calculate the $L_{Aeq,8h}$ for those exposed. This is important for small industry where the resources for regular exposure determinations are not available within the organisation.

The International Institute of Noise Control Engineering in its report on *Technical Assessment of Upper limits on Noise in the Workplace* (I-INCE: 1997) alluded to action levels but fell short of making any recommendations for action levels to be included when jurisdictions are considering noise exposure limits in the workplace.

Another form of *de facto* action level is the 'notification level'. This is usually health-based advisory level for such things as chemicals in drinking water, for example, that are prescribed to be notifiable when particular concentration levels are exceeded but for which maximum exposure levels have not been scientifically determined (CDHS 2006).

WHAT IS REQUIRED AT AN ACTION LEVEL?

The requirements in the EC Directive on noise for actions are not particularly onerous on management. They specify that: when the lower exposure action level is exceeded the employer

shall make individual hearing protectors available to workers and shall ensure that workers who are exposed ... and/or their representatives, receive information and training relating to risks resulting from exposure to noise

and between the upper action level and the exposure limit:

individual hearing protectors shall be used and individuals shall have the right to have his/her hearing checked by a doctor or by another suitably qualified person.

In practice the action required after an action level is exceeded is the decision of those who set the regulations. For compliance with the EC directive the actions required relate to the offer of hearing protectors and the presentation of information and training. A national code of practice could incorporate requirements for consultation with the workforce and the development of simple, in-house solutions.

THE IMPLICATIONS OF IMPLEMENTATION

An immediate concern to industry is typically the cost of compliance with action levels which are lower than the regulated exposure limits. So what does the introduction of defined action levels require in practice?

First there is the need to assess the risk in the working environment. The UK Health and Safety Executive (HSE: 2006) provides the following advice to employers on their responsibilities. The risk assessment should:

- *Identify where there may be a risk from noise and who is likely to be affected;*
- *Obtain a reliable estimate of your employees' exposures, and compare the exposure with the exposure action values and limit values;*
- *Identify what you need to do to comply with the law, eg whether noise-control measures or hearing protection are needed, and, if so, where and what type; and*
- *Identify any employees who need to be provided with health surveillance and whether any are at particular risk.*

This need not be a costly exercise. A basic walk through should be sufficient in most cases to establish the areas that require further checking (Williams: 2004). A simple sound level meter should be more than adequate to identify where the levels are close to the action levels but below the exposure limit.

Making hearing protectors available and providing training on the risks of excessive noise exposure are not expensive undertakings for industry. In most cases these actions are already encompassed by the duty of care to an employee by an employer. The introduction of the action level formalises that undertaking and requires some documentation and maintenance of records. This does introduce an administrative cost. Quantifying the noise level may also introduce a cost. But the costs associated with a general noise survey undertaken with a simple sound level meter, need not be great. It is only if the noise level is close to the noise exposure limit that a detailed noise survey need be undertaken.

One benefit of the action level concept is that it identifies to management and employees those areas for which noise is currently a minor issue but where it could become a major

issue if appropriate consideration is not given. The small cost of compliance with the action level is more than offset by the savings on more extensive noise control at a later date and on the cost to the community of noise induced hearing loss for the more sensitive employees.

Once the noise level rises above the exposure limit it is clear that the costs to the employer increase substantially as engineering and other exposure controls need to be implemented promptly as part of a formal noise management program.

APPLICATION IN AUSTRALIA AND NEW ZEALAND

Australia and New Zealand currently have national regulations with limits of 85 dB for $L_{Aeq,8h}$ and 140 dB for L_{Cpeak} . It would be a backward step to follow the EC directive and raise the exposure limit to 87 dB for $L_{Aeq,8h}$. It is therefore suggested that Australia and New Zealand should maintain the current exposure limits.

The EC upper action level is only 2 dB below the exposure limit. While the measurement precision of the instruments is high, there are so many variables in the workplace that the accuracy of workplace noise measurement is not high. It is therefore suggested that a single action level be introduced. Five dB between the action level and the exposure limit would be well outside the range of any measurement errors. This would create an action level at an $L_{Aeq,8h}$ of 80 dB for continuous noise and an L_{Cpeak} of 135 dB for impulse noise.

Table 2 Suggestions for exposure limits and action levels for Australia and New Zealand

Level	$L_{Aeq,8hr}$ (dB)	L_{Cpeak} (dB)
Exposure Limit	85	140
Action level	80	135

This would formalise the ‘safety factor’ approach that many experienced acousticians adopt when asked for advice by industry on occupation noise management. The introduction of a defined action level would overcome the tendency to just do nothing if the level is below the exposure limit. It would also assist those less experienced at undertaking noise assessments to understand that a ‘safety factor’ that should be considered.

CONCLUSION

The EC directive has introduced the concept of prescribed action levels below the exposure limit and these are now in force across the European community. Action levels give the advance warning that workplace noise levels are approaching the exposure limit and alert management to the potential hazard for those with more ‘sensitive’ hearing. The actions

required once these levels are passed need not be a great cost burden to industry and may well save future expenditure and protect valued employees. There would be some benefit to Australian and New Zealand in following the approach adopted by the EU.

However the use of two action levels below the exposure limit may imply a greater precision than is the case in workplace noise assessment. It is therefore suggested that the legislators in Australia and New Zealand should consider adopting a single action level 5 dB below the current exposure limits ie at an $L_{Aeq,8h}$ of 80 dB and L_{Cpeak} of 135 dB.

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